

WHAT IS CLAIMED IS:

1. A perpendicular magnetic recording medium comprising: a nonmagnetic substrate, a multilayered underlayer formed on the nonmagnetic substrate and including a ferromagnetic underlayer having perpendicular magnetic anisotropy and a weakly magnetic underlayer stacked on the ferromagnetic underlayer, and a perpendicular magnetic recording layer formed on the weakly magnetic underlayer,
wherein the ferromagnetic underlayer has a perpendicular coercive force of not more than 39.5 kA/m (0.5 kOe), and the weakly magnetic underlayer has a saturation magnetization M_s of 50 to 150 emu/cc.
2. A medium according to claim 1, further comprising a soft magnetic backing layer between the nonmagnetic substrate and the multilayered underlayer.
3. A medium according to claim 2, wherein the soft magnetic backing layer contains cobalt and at least one element selected from the group consisting of zirconium, hafnium, niobium, tantalum, titanium, and yttrium.
4. A medium according to claim 2, further comprising a cobalt-containing longitudinal hard magnetic layer between the nonmagnetic substrate and soft magnetic backing layer.

5. A medium according to claim 1, wherein the multilayered underlayer further includes an orientation control layer to control crystal orientation of the ferromagnetic underlayer, the orientation control layer being formed beneath the ferromagnetic underlayer, which faces the substrate, and having a fine crystal structure having an average grain size of not more than 3 nm.

6. A medium according to claim 5, wherein the orientation control layer contains at least one element selected from the group consisting of tantalum, niobium, cobalt, nickel, and carbon.

7. A medium according to claim 1, wherein the ferromagnetic underlayer has a saturation magnetization M_s of 300 to 1,000 emu/cc.

8. A medium according to claim 1, wherein the weakly magnetic underlayer has a thickness of 5 to 20 nm.

9. A medium according to claim 1, wherein the ferromagnetic underlayer has a thickness of 0.5 to 5 nm.

10. A medium according to claim 1, wherein at least one of the ferromagnetic underlayer, weakly magnetic underlayer, and perpendicular magnetic recording layer contains cobalt, chromium, and platinum.

11. A magnetic recording/reproducing apparatus

comprising:

a perpendicular magnetic recording medium which comprises a nonmagnetic substrate, a multilayered underlayer formed on the nonmagnetic substrate and including a ferromagnetic underlayer having perpendicular magnetic anisotropy and a weakly magnetic underlayer stacked on the ferromagnetic underlayer, and a perpendicular magnetic recording layer formed on the weakly magnetic underlayer; and
a recording/reproducing head,
wherein the ferromagnetic underlayer has a perpendicular coercive force of not more than 39.5 kA/m (0.5 kOe), and the weakly magnetic underlayer has a saturation magnetization M_s of 50 to 150 emu/cc.

12. An apparatus according to claim 11, wherein the recording/reproducing head is a single pole recording head.

13. An apparatus according to claim 11, further comprising a soft magnetic backing layer between the nonmagnetic substrate and multilayered underlayer.

14. An apparatus according to claim 13, wherein the soft magnetic backing layer contains cobalt and at least one element selected from the group consisting of zirconium, hafnium, niobium, tantalum, titanium, and yttrium.

15. An apparatus according to claim 13, further

comprising a cobalt-containing longitudinal hard magnetic layer between the nonmagnetic substrate and soft magnetic backing layer.

16. An apparatus according to claim 11, wherein
5 the multilayered underlayer further includes an orientation control layer to control crystal orientation of the ferromagnetic underlayer, the orientation control layer being formed beneath the ferromagnetic underlayer, which faces the substrate,
10 and having a fine crystal structure having an average grain size of not more than 3 nm.

17. An apparatus according to claim 16, wherein the orientation control layer contains at least one element selected from the group consisting of
15 tantalum, niobium, cobalt, nickel, and carbon.

18. An apparatus according to claim 11, wherein the ferromagnetic underlayer has a saturation magnetization M_s of 300 to 1,000 emu/cc.

19. An apparatus according to claim 11, wherein
20 the weakly magnetic underlayer has a thickness of 5 to 20 nm.

20. An apparatus according to claim 11, wherein the ferromagnetic underlayer has a thickness of 0.5 to 5 nm.

21. An apparatus according to claim 11, wherein
25 at least one of the ferromagnetic underlayer, weakly magnetic underlayer, and perpendicular magnetic

recording layer contains cobalt, chromium, and
platinum.